

Robotic Colorectal Surgery - Assessment of the Quality of Patient Information Available on the Internet using WebScraping

Stephanie Taha-Mehlitz

1. Clarunis, University Center for Gastrointestinal and Liver Diseases, St. Clara Hospital and University, Hospital Basel, 4002 Basel

Vincent Ochs

2. Roche Innovation Center Basel, Department of Pharma Research & Early Development, 4070 Basel,

Anas Taha (✉ anas.taha@unibas.ch)

3. Department of Biomedical Engineering, Faculty of Medicine, University of Basel, 4123 Allschwil

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Abstract

Background

The primary goal of this study is to assess the current patient information available on the internet concerning robotic colorectal surgery. The study is a review, and acquiring this information is relevant to understanding the subject's current and future scope.

Methods

We acquired data for this study through a web-scraping algorithm. The algorithm used two Python packages: Beautiful Soup and Selenium. The long-chain keywords incorporated into the Google, Bing and Yahoo search engines for this study were "Da Vinci Colon-Rectal Surgery", "Colorectal Robotic Surgery" and "Robotic Bowel Surgery". After sorting the 207 websites, 5 investigators evaluated the websites according to the Ensuring quality information for patients (EQIP) score.

Results

Of the 207 websites visited, 49 belonged to the subgroup of hospital websites (23.6%), 46 to Medical Centers (22.2%), 45 to Practitioners (21.7%), 42 to Health Care Systems (20.2%), 11 to News Services (5.3%), 7 to Web Portals (3.3%), 5 to the Industry (2.4%), and 2 to Patient Groups (0.9%).

Conclusion

The quality of the information available on the internet concerning robotic colorectal surgery is low since only 82 websites received a high rating. Most of the information on the different websites is inaccurate, consequently medical facilities involved in robotic colorectal surgery, robotic bowel surgery and related should develop credible websites to guide patient decisions.

Introduction

In the previous twenty years, the internet has become a widely used tool by patients to gather medical information. The increase in the number of patients gathering information online further triggered a rise in the number of websites providing healthcare information. However, the quality of data found on different websites varies since some articles contain high-quality information guided by research and evidence. In contrast, others have low-quality information steered by assumption. The concept of online patient data can transform how patients acquire medical services by challenging the traditional methods that prevailed before the age of the internet. Robotic colorectal surgery involves the utilization of a robot to perform surgical procedures. This notion gained momentum in 2001 after the da Vinci robot made its first appearance in this medical sphere [1]. The introduction of the da Vinci robot resulted from the

challenges surgeons experienced when using laparoscopy and the traditional open surgery approach. However, robotic surgery triggered increased costs and longer operative hours than laparoscopic methods in colorectal surgery [2]. Nonetheless, the importance of robots in colorectal surgery has far outweighed this factor. For example, the technologies offered by the system have allowed a surgeon to better visualize the surgery site, which eases dissection and permits minimal invasion [3]. The advantage of this approach, like the laparoscopic methods, is that it enables surgeons to make tiny incisions compared to the open Approach. The main advantages of robotic colorectal surgery are that it ensures sufficient operative time, enhances results and in addition it lowers conversion rates from robotic to open surgery [4]. Robots have provided additional benefits to users and surgeons, such as treating various pathologies like rectal cancer [5].

Furthermore, robots provide an enhanced camera platform and consist of articulated instruments that eliminate many forms of human error [2]. As an outcome, patients bleed less and incur reduced pain. [S13] [AT14] Robotic colorectal surgery also prevents the likelihood of infection since there is minimal human contact between the surgeon and the patient than when using traditional approaches. Contact only occurs during port insertion, specimen extraction, and closure. The little invasion provided by this method ensures the safety of surgical procedures and minimizes risks and complications compared to traditional approaches. A study comparing the efficiency of laparoscopic and robotic colorectal surgeries revealed that robotic surgery had the potential to minimize the degree of intraoperative conversion in various patients [6].

Hospitals will have to invest significant funds to provide crucial education on operating robots for surgery to guarantee maximum performance. Also, the advancement of technology is inevitable, which implies that current equipment will still undergo replacement in the future for more advanced approaches, hence more cost. Despite the presence of many articles discussing robotic colorectal surgery, there is minimal information detailing the quality of patient data concerning this topic. The healthcare information available on various websites plays a crucial role in influencing the decisions derived by patients concerning their condition and the forms of treatment they adopt. Nevertheless, the website information is often uncontrolled and undependable. Thus, the availability of high-quality information concerning robotic colorectal surgery may trigger raised awareness of the disease and the deployment of the most appropriate forms of surgery for enhanced outcomes. Also, high-quality information advances informed consent while simultaneously encouraging patient-centered care.

At that juncture, the primary goal of this manuscript is to conduct an assessment of patient information on the internet concerning robotic colorectal surgery. We will gather all the current information on the concept found in literature to understand what data patients currently possess, through the review.

Materials And Methods

The data was collected in November 2021 by an investigator using a web-scraping algorithm with the Python packages BeautifulSoup and Selenium. The top popular search engines Google, Bing and Yahoo

were utilized and the long tailed keywords which were used were "Da Vinci Colon-Rectal Surgery", "Colorectal Robotic Surgery" and "Robotic Bowel Surgery". For that, the program went through the initialized keywords and extracted the Uniform Resource Locator (URL`s) found. To make sure that no duplicates occurred within each of the three search engines, they got skipped by the algorithm once they were collected. The first 150 unique results have been scraped from Google, followed by 150 unique websites from Yahoo 150 and the same with from Bing. All 450 webpages were scraped in English and 163 websites which have been duplicates between the search engines, have been excluded. To do so, the python script compared the three lists of collected websites and removed the duplicates. Two investigators checked whether the websites were in English or not. [S20] Excluded from the 287 eligible websites were irrelevant websites which have used the long-tailed keyword in a different context. We have excluded 39 of those, after two investigators checked the scraped websites manually again. Additionally, we excluded 41 academic or scientific pages such as professional sites, scientific articles, or journals, based on the assumption that these are not used on a regular basis for gathering information about a surgery approach by 'the man in the street'. Finally, the 207 eligible websites have been investigated by two investigators manually to verify results. After that, websites were categorized into the following groups:

Hospitals, Medical Centers, Practitioners, News Services, Patient Groups, Web Portals, The Industry which is defined as the group of people who are using Robotic approaches in the sector of surgery and the Health Care Systems.

For rating the webpages, the modified Ensuring quality information for patients (EQIP) instrument has been used, which inhibits 36 items for evaluating the content and the structure of an information source for patients. This was done by five experts of the field. Using a binary scale, the overall results for the EQIP score can be found in Table 1 by indicating how often a certain item was found in the websites.

For the statistical analysis, the program Python (Version 3.9) was used. Categorical variables were compared with the Fischer's test and the student's t-test were used for comparing continuous variables. The p values < 0.05 were considered as being statistically significant and all were two sided.

The rating was based on the equally weighted items of the EQIP score and from 0–36 and five investigators with different levels of experience rated these websites based on this score.

Results

287 websites in English which contained the long-tailed keywords mentioned above sourced from the Google, Bing und Yahoo search were scraped using a web scraping algorithm. After we excluded 39 irrelevant websites and 41 scientific articles websites which are intended for scientists, only 207 eligible websites underwent the statistical analysis (see Fig. 1).

Of these 207 websites, 49 belong to the subgroup of hospital websites (23.6%), 46 to Medical Centers (22.2%), 45 to Practitioners (21.7%), 42 to Health Care Systems (20,2%), 11 to News Services (5.3%), 7 to

Web Portals (3.3%), 5 to the Industry (2.4%), and 2 to Patient Groups (0.9%).

Regarding the scores, the overall median of the websites is 20 (IQR 15–21) from which websites with a score of around 21 (75th percentile) have a high rating. Out of the 207 scraped websites, 82 (39%) have a high score, whereas the rest have a low rating (61%) – see Fig. 2.

The top-scored websites of all scraped ones are the ones who achieved a sufficient number of points and fulfilled more items than the 95th percentile (> 23 , see Table 2). The best website achieved 27 out of 36 points.

The two lowest scores were 7 and 8. No website managed to achieve the maximum 36 points. Regarding the source of information, the industry has the best scores compared to the other fields (see Fig. 2). The lowest scores were the websites of the web portals. In Fig. 2, the box plot presents all the websites and their scores based on the field of information where the upper line of the boxplot represents the 75th percentile while the lower the 25th percentile. Having calculated the scores of all sources of information, a few categories were able to succeed the median, but only the field of the industry managed to achieve a reasonable score compared to the overall median.

Table 1
Overall Results of the Included Web Sites According to the Modified Ensuring Quality Information for Patients.

Item	Criteria	Yes (%)	No (%)
1	Initial definition of which subjects will be covered	195 (94.2%)	12 (5.8%)
2	Coverage of the previously defined subjects (0 if the answer is "no" for Item 1)	186 (89.9%)	21 (10.1%)
3	Description of the medical problem	178 (86%)	29 (14%)
4	Definition of the purpose of the surgical intervention	167 (80.7%)	40 (19.3%)
5	Description of treatment alternatives	149 (72%)	58 (28%)
6	Description of the sequence of the surgical procedure	141 (68.1%)	66 (31.9%)
7	Description of the qualitative benefits to the recipient	167 (80.7%)	40 (19.3%)
8	Description of the quantitative benefits to the recipient	103 (49.8%)	104 (50.2%)
9	Description of the qualitative risks and side effects	112 (54.1%)	95 (45.9%)
10	Description of the quantitative risks and side effects	100 (48.3%)	107 (51.7%)
11	Addressing quality-of-life issues	127 (61.4%)	80 (38.6%)
12	Description of how complications are handled	109 (52.7%)	98 (47.3%)
13	Description of the precautions that the patient may take	134 (64.7%)	73 (35.3%)
14	Mention of warning signs that the patient may detect	123 (59.4%)	84 (40.6%)
15	Addressing medical intervention costs and insurance issues	156 (75.4%)	51 (24.6%)
16	Specific contact details for hospital services	172 (83.1%)	35 (16.9%)
17	Specific details of other sources of reliable information/support	163 (78.7%)	44 (21.3%)

Item	Criteria	Yes (%)	No (%)
18	Coverage of all relevant issues for the topic (summary item for all content criteria)	141 (68.1%)	66 (31.9%)
19	Date of issue or revision	148 (71.5%)	59 (28.5%)
20	Logo of the issuing body	73 (35.3%)	134 (64.7%)
21	Names of the persons or entities that produced the document	155 (74.9%)	52 (25.1%)
22	Names of the persons or entities that financed the document	139 (67.1%)	68 (32.9%)
23	Short bibliography of the evidence-based data used in the document	6 (2.9%)	201 (97.1%)
24	Statement about whether and how patients were involved/consulted in the document's production	160 (77.3%)	47 (22.7%)
25	Use of everyday language and explanation of complex words or jargon	175 (84.5%)	32 (15.5%)
26	Use of generic names for all medications or products (0 if no medications described)	0 (0.0%)	207 (100%)
27	Use of short sentences (< 15 words on average)	148 (71.5%)	59 (28.5%)
28	Personal address to the reader	184 (88.9%)	23 (11.1%)
29	Respectful tone	191 (92.3%)	16 (7.7%)
30	Clear information (no ambiguities or contradictions)	191 (92.3%)	16 (7.7%)
31	Balanced information on risks and benefits	124 (59.9%)	83 (40.1%)
32	Presentation of information in a logical order	181 (87.4%)	26 (12.6%)
33	Satisfactory design and layout (excluding figures or graphs)	177 (85.5%)	30 (14.5%)
34	Clear and relevant figures or graphs (0 if absent)	16 (7.7%)	191 (92.3%)
35	Inclusion of a named space for the reader's notes or questions	27 (13%)	180 (87%)
36	Inclusion of a printed consent form contrary to recommendations (0 if not from hospitals)	121 (58.5%)	86 (41.5%)

Table 2
Top rated websites

Ranking	Website	Source of Information	Score
1	http://www.nwcch.com/	Hospitals	27
2	https://www.gwhospital.com/	Hospitals	26
2	https://www.cancercenter.com/	Hospitals	26
3	http://www.paulsavocamd.com	Practitioners	25
3	https://www.davincisurgery.com/	Practitioners	25
3	http://www.chicagocolorectal.com	Medical Center	25
4	https://www.colorectalcentre.co.uk/	Hospitals	24
4	https://www.uclahealth.org	Hospitals	24
4	http://www.colorectalsurgeonssydney.com.au	Hospitals	24
5	https://www.orlandohealth.com/	Medical Center	23

Discussion

Presently, there is little data concerning the quality and legibility of websites focusing on robotic colorectal surgery. This study analyzed 207 websites with publications concentrating on robotic colorectal surgery via the EQIP tool. The findings implied that out of the 207 websites, 125 websites contained not sufficient information or information that was not clear to the investigators. The evaluation conducted using the EQIP tool illustrated that most of the sites had received a low rating, which indicated that they probably contained low-quality information. As an outcome, the median EQIP score of all the articles, which was 20 out of 36, highlighted the prevalence of low-quality data concerning robotic colorectal surgery. On the one hand, the lowest-scoring data sources on robotic colorectal surgery were the articles by medical center websites, news stations, and web portals. On the other hand, hospitals, practitioners, health care systems, and the industry had the best scores. When evaluating the content of the sites, an extensive range of studies highlighted the fragmented experience with robot systems instead of the results of robotic colorectal operations. The main topics of the websites ranged from addressing how hospitals used the technology to the future development of this process.

For accessing the data in the websites, you can use a webcrawler algorithm. Webscraping refers to creating or using a computer software to extract data from entire websites or a few web pages. Also when you perform web scraping, you can either download the entire web page or key aspects such as the < title > tag or article body content for further analysis. Robust web scrapers allow you to automatically extract data from websites, this allows you or your co-workers to save time that would've have otherwise been spent on multiple data collection tasks. It also means that you can collect data at greater volume

than a single human could ever hope to achieve. But for all this, you would need to have someone who knows how to code.

Also, most of the articles concentrate on the utilization of the robotic approach during this process. The primary reason for the development of robotic surgeries in colorectal procedures arose from the challenges presented by the laparoscopic approach. According to Gorgun, laparoscopy did not have a 3D view, limited movement, surgeon-dependent camera maneuverability, and retraction [7]. Therefore, the introduction of the robotic system aimed to solve these problems. For instance, Antoniou et al. described the plan as having three parts: the computer console, the robot tower, and the video cart, as evident in [8, 9], allowing surgeons to be more flexible while having a surgery approach and to increase the overall hygiene. This factor explains why many authors tend to evaluate the benefits of using robots when performing colorectal surgeries.

A case study spearheaded by Morelli et al. revealed that using robots in colorectal surgeries reduced surgical complications and lowered conversion rates [10]. This statement showcases that surgeons realize the advantages brought about by the Robotic system, such as triangulation restoration and reduced clashes of instruments. In a similar perspective, Ngu, Tsang, and Koh highlighted the capabilities of the latest Robotic system, Xi [11, 12]. The method comprises rotating arms and demonstrates an improved and simplified docking process. The high acceptance of the robotic system signifies that many hospitals consider using the approach when performing colorectal surgery. Comparing the Xi system to older models like Da Vinci Si reveals that the former is more efficient and reduces the time taken for operation [13]. Also, the robotic Xi robot triggers reduced bleeding and postoperative complications [14, 15]. As an outcome, surgeons have adopted the approach to deal with complicated conditions like rectal cancer. However, a comparison between the robot and Micro-Hand robot-assisted surgery showed that the latter had advantages over the former based on hospitalization costs and postoperative stay [16].

The preference for minimally invasive procedures by both surgeons and patients has encouraged the development of the robot. Among the recent developments are the robotic Single-Site method, which permits surgeons to handle the technical complexities of laparoscopy. A review by Bae et al. showcased that the main advantage of the Single-Site platform is that it encourages regular triangulation, thereby making it easier for surgeons to perform colorectal surgeries [17]. Therefore, it remains evident that the robotic system provides benefits to surgeons and patients undergoing colorectal surgery [18]. The availability of this information on the internet implies that patients, particularly those from low-income homesteads, can acquire sufficient and accurate data on the subject. However, individuals must back up this information with a physician consultation to guarantee that the procedures are available in specific countries. Failure to do this leads to situations where patients are misinformed. Consulting a medical professional will permit a detailed discussion of the information found on the internet and allow surgeons to help clients differentiate facts from myths. Nevertheless, individuals from well-off backgrounds often consult physicians. In contrast, people from impoverished backgrounds rarely do so, making the former have a privilege over the latter when processing information from the internet.

This research is a comprehensive evaluation of the information quality on the internet relating to robotic colorectal surgery. The survey by Wasserman et al. used the DISCERN tool to evaluate online data quality [20]. The paper's results indicated that the present information on colorectal cancer was variable, incomplete, and failed to convey data that can guide patients into reaching a well-informed conclusion about the treatment options available when managing colorectal cancer. These findings are consistent with the results of this study since most of the websites included in this study were unreliable. Patient information is rapidly becoming a form of patient-centered care because many patient-focused practitioners are focusing on patient data to develop ways of enhancing quality and reliability. In today's society, many patients search the internet to find information on different medical subjects. A cross-sectional study spearheaded by Bianco et al. (2013), revealed that 83 percent of internet users obtained health-associated data online either for their self, family, or acquaintances [20]. This situation implies that the internet is an extensive and unregulated platform that permits anyone to obtain healthcare information. Since the authors of website articles do not comply with a formal quality control procedure, they often post data that does not have sufficient accompanying evidence, or it simply does not rely on comprehensive research. For example, people may post information gathered from a small study population, implying that the findings may not represent the wider population, thus confusing consumers. Moreover, such a situation exposes patients to the consequences of acquiring inaccurate data, which adversely affects their ability to make appropriate decisions concerning their condition and/or treatment. Therefore, it remains crucial for the various medical institutions to collaborate and educate patients on the type of information they should trust and how to assess the validity and quality of the data. Likewise, patients should ask for the assistance of medical professionals to process information found on the internet since some blogs publish inaccurate data with malicious intentions. For this study, we evaluated the quality of websites using the EQIP tool. Other tools that we could have used include the DISCERN and the Health Educator Centre Tool. Despite the prevalence of multiple quality analysis tools, very few of them have undergone testing to guarantee their reliability. After evaluating and comparing the tools against one another, we decided to use the EQIP tool due to its ability to analyze the format of information presentation and the content of the publications. EQIP is a better tool for [S46] this research than DISCERN. EQIP was able to distinguish between information of poor and high quality and correlated with other measures of information quality [21]. DISCRAN is similar in its objectives to the EQIP tool [21]. Also, McCool et al. identify EQIP as a validated approach for analyzing the comprehensibility, design, and excellence of written data [22]. Since its development, EQIP has showcased that it is trustworthy and reproducible [23]. The information available on the internet can influence the kind of decisions patients make concerning robotic colorectal surgery and thus encourage them to consider alternative options, as opposed to what surgeons might suggest.

Limitations:

There is a possibility that this study may not be relevant in a few years, particularly if the authors start presenting quality data via the websites they develop. Therefore, we view that the outcomes of this research represent the current data on the internet concerning robotic colorectal surgery in 2021. This

research reveals the lack of availability of quality information on the internet about the research topic. Thus, the medical community should develop high-quality websites to guarantee patient-centered approaches that provide relevant and accurate information regarding robotic colorectal surgery. The absence of extensive data on the topic implies that patients will have minimal documents to refer to when conducting individual research on the internet on the subject. Future researchers should deal with this literature gap by conducting more research on the topic to ensure that other researchers, surgeons, and patients can utilize a greater volume of useful data for reference purposes.

Conclusions

The use of the internet as a primary information source has increased over the years. The current quality of healthcare data about robotic colorectal surgery is minimal and inaccurate since only 39% of the articles included in the study were high quality. The main controversy identified in this research is the discrepancies of the arguments for and against robotics in colorectal surgery.

Hence, all the experts involved in robotic colorectal surgery should actively develop websites containing reliable scientific and proven data-driven information that patients can trust and use. Different medical practitioners must evaluate and give advice concurrent with the specific information available on websites concerning robotic colorectal surgery. Availability of such data may guarantee long-term treatment results.

Declarations

Author Contributions: Conceptualization A.T., S.T.-M. data collection V. O. .; visualization S.T.-M., writing—original draft S.T.-M., A.T. writing—review and editing A.T. All authors have read and agreed to the published version of the manuscript.

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Figures

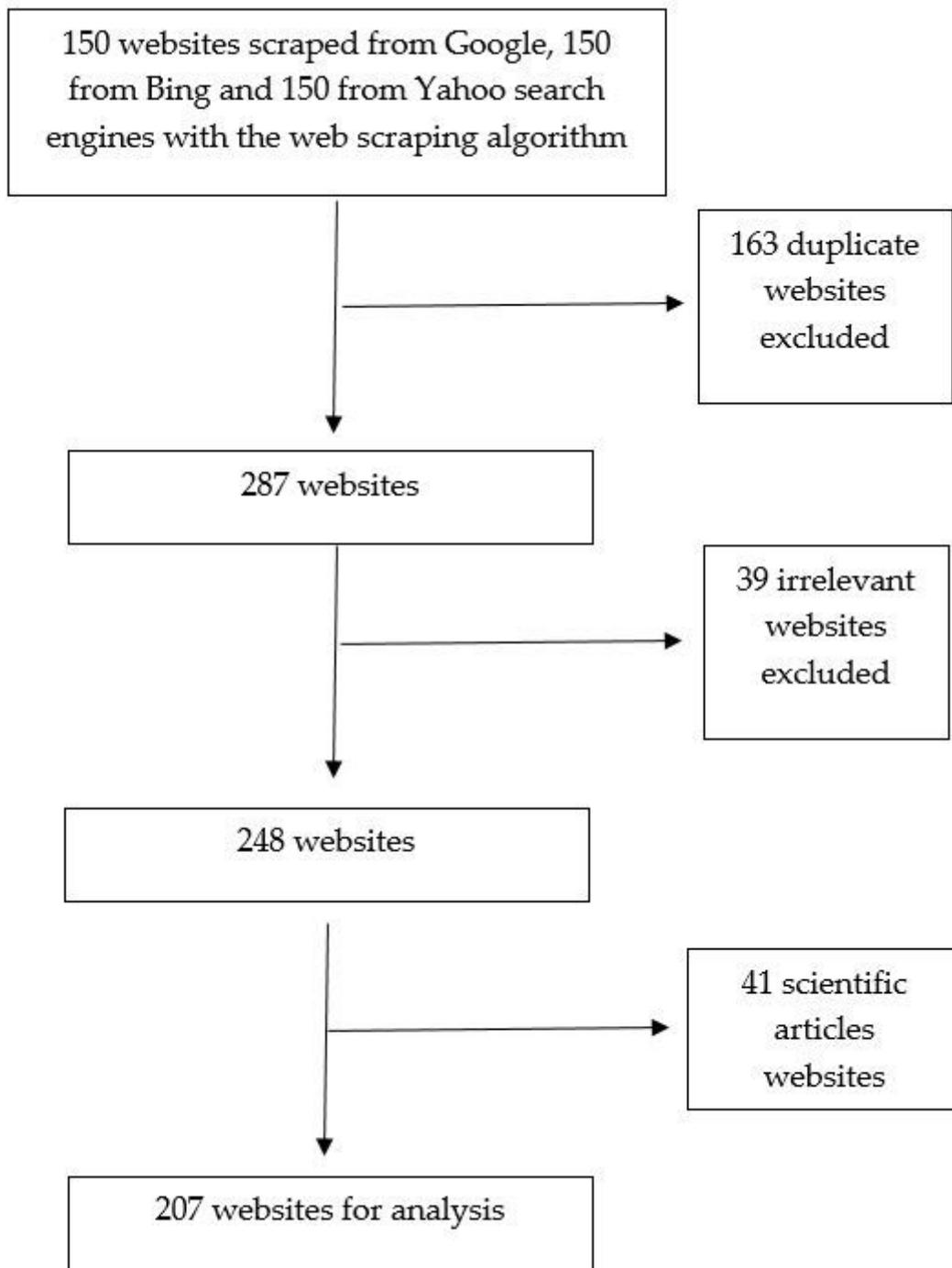


Figure 1

Flow chart showing how relevant websites were identified, screened, and included to our study.

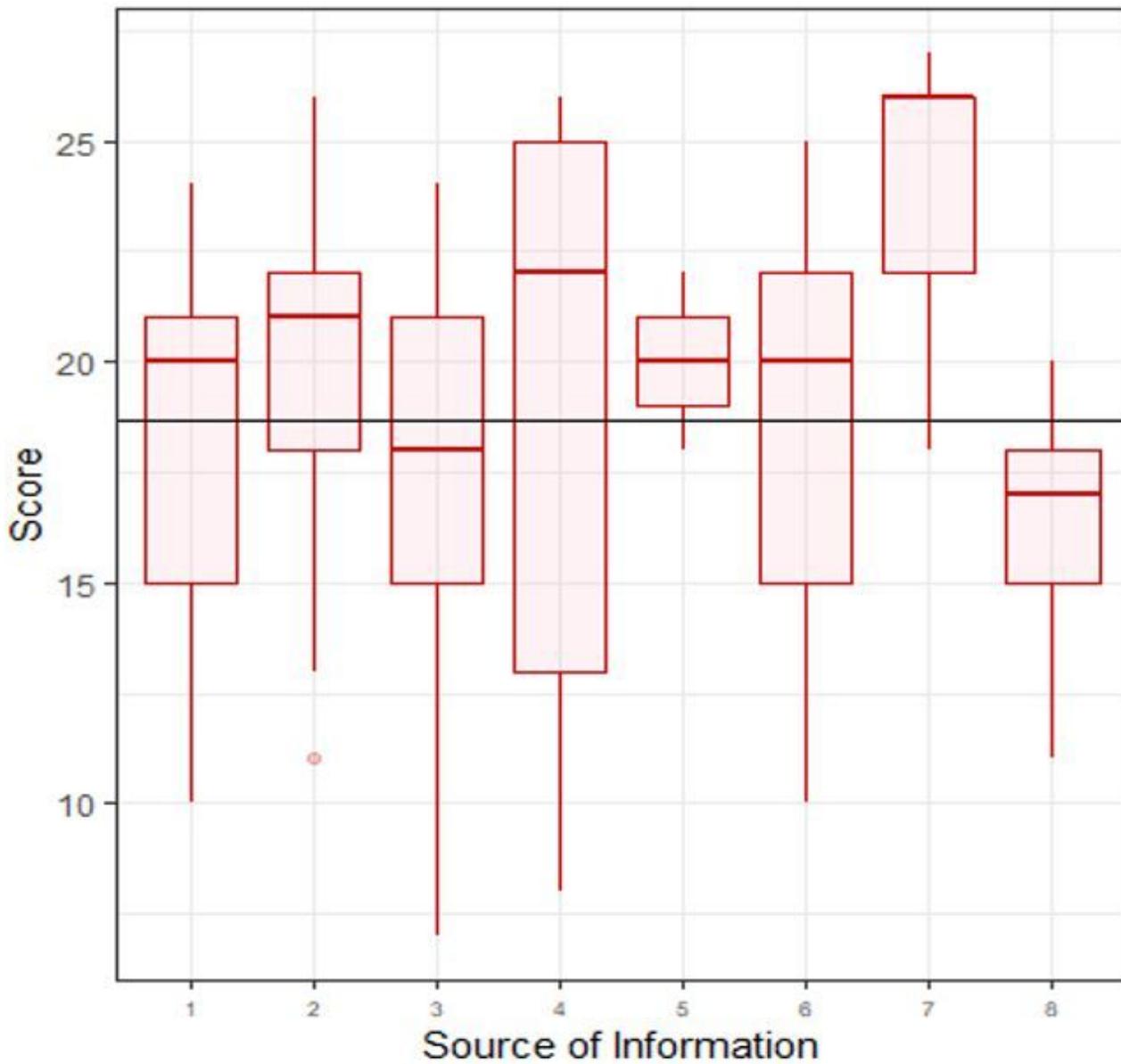


Figure 2

Histogram of the number of the websites and their EQIP scores. 1 = Health Care System, 2 = Hospital, 3 = Medical Center, 4 = News Services, 5 = Patient Group, 6 = Practitioner, 7 = The Industry, 8 = Web Portal